

**WHAT IS CLAIMED IS**

1. A chemical process reactor for processing an industrial gas flow through the application of heat, comprising:
  - a. a housing having at least one gas flow inlet for receiving said industrial gas flow, and at least one outlet;
  - b. a gas flow channel within said housing, and an array of current-carrying wire screen element packets connected between respective conductor blocks, said conductor blocks forming outside walls of said channel and said packets positioned at spaced apart intervals across said channel from a first position proximate said outlet and a second position internal to said housing;
  - c. a plurality of passages through said conductor blocks, having respective inlet openings in flow communication with said at least one gas flow inlet, and having respective outlet openings proximate said second position of said channel;
  - d. said array further comprising a first electrical bus connected to a respective first conductor block proximate said outlet, and a second electrical bus connected to a respective last conductor block proximate said second position, each of said conductor blocks being electrically isolated from other conductor blocks, and each of said screen element packets having a first termination connected to a conductor block on one side of said channel and having a second termination connected to a conductor block on the other side of said channel, whereby a series electrical path is created from said first electrical bus through respective conductor blocks and screen element packets to said second

electrical bus;

e. a first conductor connected to said first electrical bus and projecting externally of said housing, and a second conductor connected to said second electrical bus and projecting externally of said housing; and

f. a pair of expansion joints respectively attached to said housing, each of said expansion joints having a movable end connected to one of said first or second conductors.

2. The apparatus of claim 1, wherein each of said screen element packets further comprise a plurality of conductive metal screen sections arranged in layers, said sections being collectively attached together at respective first and second parallel edges to form first and second edge terminations.

3. The apparatus of claim 2, wherein said conductor blocks in said array each further comprise a flat surface adjacent respective ends, with a center section having a raised portion, said raised portion further comprising an inclined plane surface; an end piece slidable along each of said flat surfaces; a wedge block having an inclined surface facing said inclined plane and being slidable thereon, and means for drawing said wedge block along said inclined plane and toward said conductor block respective flat surfaces.

4. The apparatus of claim 3, further comprising engagement slots between said conductor block and each of said end pieces, whereby movement of said end pieces away from said conductor block is restrained, while relative sliding motion is permitted.

5. The apparatus of claim 4, further comprising a screen element packet termination edge clamped between said wedge block and said end piece.

6. The apparatus of claim 5, further comprising aligned openings through said end piece, said wedge block, said termination edges of said screen element packet, and said center section of said conductor block, and rods passing through said aligned openings, said rods being threadably attachable to said center section.

7. The apparatus of claim 1, further comprising first and second electrically isolate backing plates, each plate aligned along said channel outside said conductor blocks, whereby said conductor blocks are slidable over respective ones of said first and second electrically isolated backing plates.

8. The apparatus of claim 1, wherein said pair of expansion joints each further comprise a base sealably connected to said housing and extending about one of said conductors, an expandable bellows body extending from said base and connecting to a flange which is fixedly attached to said conductor.

9. A chemical process reactor for processing an industrial gas by flowing the gas through the reactor and heating the gas during its residence time within the reactor, comprising:

a. a reactor housing having a gas inlet and a gas outlet proximate one end, and having a conductor pair

extending from the other end;

b. an elongate frame in said housing, having a first end proximate said gas outlet and having a second end extending substantially into said housing, whereby a gas flow channel is created through said frame to said gas outlet;

c. an array of current-carrying wire screen element packets aligned at spaced apart positions, each element being fixedly attached between a pair of conductor blocks, and said conductor blocks being attached in adjacent alignment along said frame;

d. a plurality of aligned passages through said conductor blocks and an entry passage through said frame proximate said gas inlet, said entry passage being in flow communication between said gas inlet and said plurality of aligned passages; said plurality of aligned passages respectively opening proximate said interior gas channel opening;

e. said array further comprising a first electrical bus connected to a respective first conductor block proximate said frame first end, and a second electrical bus connected to a respective last conductor block proximate said frame second end, each of said conductor blocks being electrically isolated from other conductor blocks, and each of said screen element packets having a first termination connected to a conductor block on one side of said channel and having a second termination connected to a conductor block on the other side of said channel, whereby a series electrical path is created from said first electrical bus through said respective conductor blocks and screen element packets to said second electrical bus;

f. a first conductor connected to said first electrical bus and projecting externally of said reactor housing and a second conductor connected to said second electrical bus and projecting externally of said reactor housing; and

g. A pair of expansion joints respectively connected to said housing and each of said joints connected to a first or second conductor.

10. The apparatus of claim 9, wherein each of said screen element packets further comprise a plurality of conductive metal screen sections arranged in layers, said sections being collectively attached together at respective first and second parallel edges to form first and second edge terminations.

11. The apparatus of claim 10, wherein each of said conductor blocks in said array further comprise at least one end piece having a raised edge; a center section having a raised portion with an inclined plane surface facing said end piece; a wedge block having an inclined surface facing said inclined plane and being slidable thereon, and means for drawing said wedge block along said inclined plane and inwardly toward said conductor block.

12. The apparatus of claim 11, further comprising a screen element packet termination edge clamped between said wedge block and said end piece.

13. The apparatus of claim 12, further comprising first and second electrically isolated backing plates, each

plate aligned along said channel outside said conductor blocks whereby said conductor blocks are slidable over respective ones of said first and second electrically isolated backing plates.

14. A chemical process reactor for heating gas in a continuous flow passing through the reactor, comprising:

a. a housing having an inlet for receiving gas flow, and interior chamber, and an outlet for passing gas flow;

b. an elongate structure in said interior chamber, said structure having elongate, thermally-insulated walls and respective open ends, thereby creating a gas channel flow path inside said walls, one of said open ends being positioned proximate said outlet;

c. an elongate array of spaced-apart wire screen element packets in said gas channel, each of said packets having a first termination end clamped to a conductor on one side of said channel and a second termination end clamped to a conductor on the other side of said channel, all of said packets and conductors electrically connected in series, thereby providing a current flow path between a forwardmost screen packet and a rearwardmost screen packet and passing through all intermediate screen packets;

d. a first conductor attached to one end of said array, and a second conductor attached to the other end of said array, both of said conductors having respective ends projecting externally of said housing; each of said conductors further comprising thermal expansion joints permitting relative movement between said conductor and said housing; and

e. gas passages through said conductors on each side

of said channel, said passages being in flow communication with said housing inlet at one end, and said gas channel on the other end.

15. The apparatus of claim 14, wherein said array further comprises a first electrical bus connected to a respective first conductor block proximate said outlet, and a second electrical bus connected to a respective last conductor block proximate the interior end of said channel; each of said conductor blocks being electrically isolated from other conductor blocks; each of said screen element packets having a first termination end connected to a conductor block on one side of said channel and having a second termination end connected to a conductor block on the other side of said channel, whereby said series electrical path is created from said first electrical bus through respective conductor blocks and screen element packets to said second electrical bus.

16. The apparatus of claim 15, wherein each of said screen element packets further comprise a plurality of conductive metal screen sections arranged in layers, said sections being collectively attached together at respective first and second parallel edges to form first and second edge terminations.

17. The apparatus of claim 16, wherein said conductor blocks in said array each further comprise a flat surface adjacent respective ends, with a center section having a raised portion, said raised portion further comprising an inclined plane surface; an end piece slidable along each of

said flat surfaces; a wedge block having an inclined surface facing said inclined plane and being slidable thereon, and means for drawing said wedge block along said inclined plane and toward said conductor block respective flat surfaces.

18. The apparatus of claim 17, further comprising a screen element packet termination edge clamped between said wedge block and said end piece.

19. The apparatus of claim 18, further comprising aligned openings through said end piece, said wedge block, said termination edges of said screen element packet, and said center section of said conductor block, and threaded fasteners passing through said aligned openings, said threaded fasteners being threadably attachable to said center section.